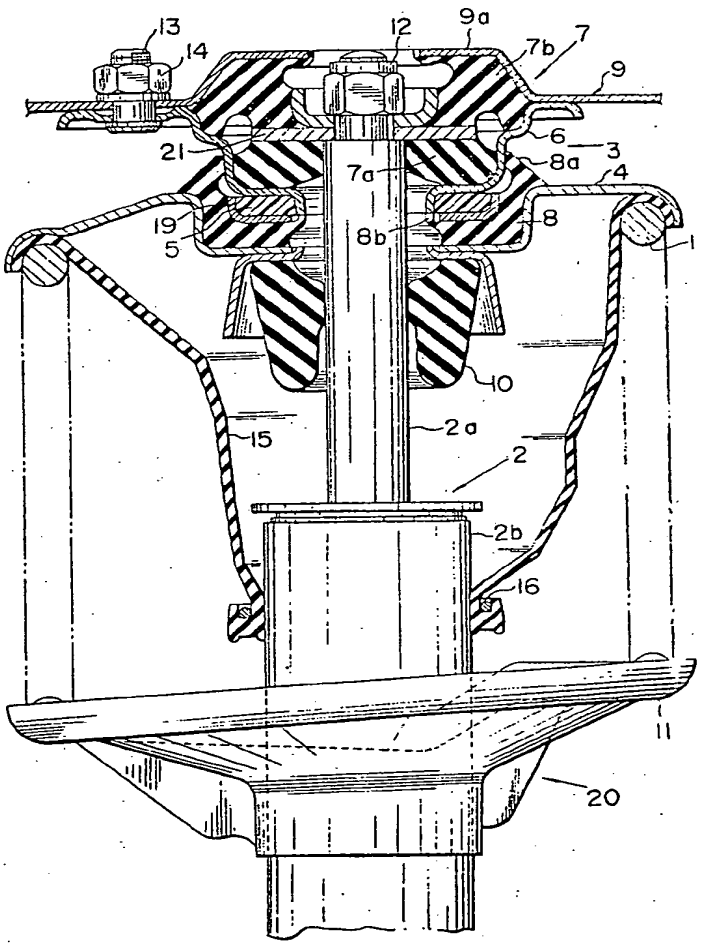
(12) UK Patent Application (19) GB (11) 2 050 557 A

(21) Application No 8012414
(22) Date of filing 15 Apr 1980
(30) Priority data
(31) 54/048142
(32) 18 Apr 1979
(33) Japan (JP)
(43) Application published
7 Jan 1981
(51) INT CL³
F16F 9/54
(52) Domestic classification
F2S BT
(56) Documents cited
GB 2027161A
GB 2026131A
GB 1495643
GB 1245658
GB 1238642
GB 827261
(58) Field of search
B7D
F2S
(71) Applicant
Nissan Motor Company Limited, 2, Takara-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken, Japan
(72) Inventors
Kazuo Chiba,
Iwao Nakamura
(74) Agent
F. J. Cleveland & Company

(54) Resilient Mounting of Vehicle Suspension Struts

(57) A strut-type suspension unit, comprising a shock absorber 2 and a coil spring 1, is mounted on the vehicle body via a rubber mounting divided into two separate parts, one block 7 mounting the piston rod 2a of the shock absorber and the other block 8 mounting the coil spring 1 and the bump stop 10 of the shock absorber. The block 7 is preferably less rigid than the block 8.

FIG.1

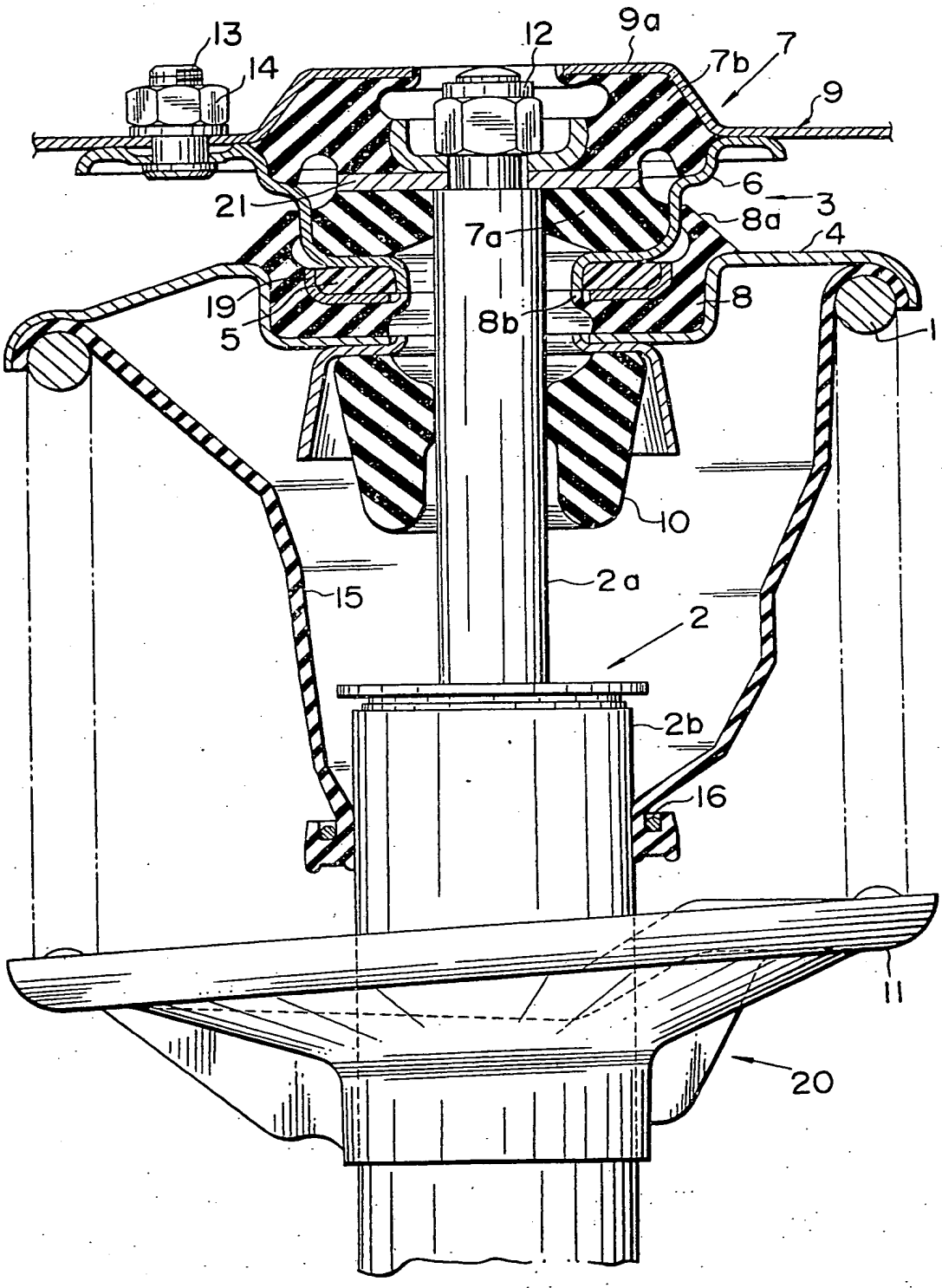


The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

GB 2 050 557 A

2050557

FIG.1



2050557

FIG.2

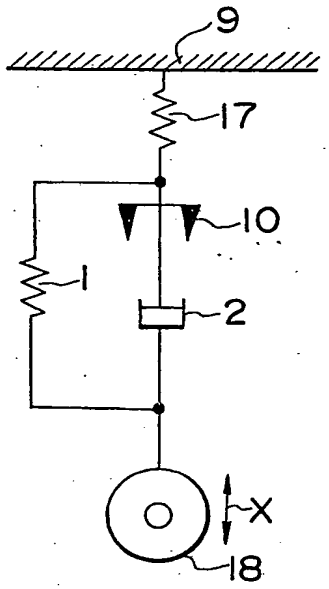
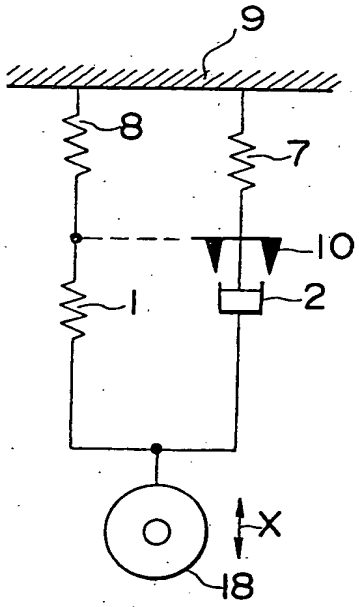


FIG.3



SPECIFICATION

A Strut Type Suspension for a Vehicle

The present invention relates to a strut type suspension for a vehicle.

In order to provide a strut type suspension onto a vehicle body, a single insulator made of rubber is commonly applied to both a piston rod of a shock absorber and a coil spring attached to the shock absorber of the vehicle body. Such an insulator must have a large rigidity for the purposes of increasing its durability and decreasing the maximum magnitude of deflection, because a big magnitude of force from the vehicle body and a bumper pad fitted to the shock absorber is applied thereto. Thus, the insulator can not damp effectively the small oscillations when the piston rod of the shock absorber is in stick relationship with a strut tube of the strut so that the driver feels uncomfortable due to such an oscillation of the vehicle body.

Another conventional insulator is divided into two parts, one for the shock absorber and bumper pad, and the other for the coil spring. Such an insulator must also have a large rigidity so as to increase its durability and decrease its maximum deflection. It results in the driver's uncomfortable feeling.

Summary of the Invention

An object of the present invention is to eliminate such disadvantages of the prior art strut type suspension provided with an insulator.

A further object of the present invention is to improve the driver's and/or passenger's feeling in driving.

It is still a further object of the present invention to provide an improved strut type suspension wherein a small oscillation can be effectively damped when a shock absorber is in a stick condition.

According to the present invention, a suspension for a vehicle includes a mounting insulator rubber divided into two separate parts, one for a piston rod of a shock absorber, and the other for a spring coil attached to the shock absorber and a bumper rubber fitted on the piston rod of the shock absorber. It is preferable that the latter has a larger rigidity than that of the former.

Brief Description of the Drawings

These and other objects and features of the present invention will become more apparent from the following description of a preferred embodiment thereof taken in conjunction with the accompanying drawings in which:

Figure 1 is a vertical section showing a strut type front suspension according to the present invention;

Figure 2 is a schematic view showing in a simplified form a conventional strut type suspension model; and

Figure 3 is a view similar to Figure 2, showing a strut type suspension model according to the present invention.

Description of the Preferred Embodiment

Referring now to Figure 1, a strut 20 is connected at its lower end with a steering knuckle (not shown) and provided at its upper portion with a shock absorber 2 in a well known manner. The strut 20 is connected through a piston rod 2a protruding from its top end and a mounting insulator 3 to the vehicle body 9. A coil spring 1 is attached between a lower spring seat 11 on the strut 20 and an upper spring seat 4 on the mounting insulator 3. The mounting insulator 3 includes a first insulator rubber 7 for the piston rod 2a and a second insulator rubber 8 for the coil spring 1, the first and second insulators 7, 8 being separate to each other. The first insulator rubber 7 is fitted between a portion 9a of the vehicle body 9 for attaching the strut 20 and a circular bracket 6 fixed to the vehicle body 9 by a bolt 13 and nut 14 in such a way that the lower and upper portions 7a, 7b of the first insulator 7 press in the opposite directions a washer 21 fixed at the top end of the piston rod 2a by a self-locking nut 12. The second insulator rubber 8 is placed between the upper spring seat 4 and a second bracket 19 attached through a bearing 5 onto the lower portion of the first bracket 6 in such a way that it does not contact the piston rod 2a. The second insulator rubber 8 has a larger rigidity than that of the first insulator rubber 7. For example, a spring constant of the second insulator rubber 8 is set 100 kg/mm, being higher than a normal rigidity of the prior art mounting insulator while a spring constant of the first insulator rubber 7 is 20 kg/mm. Such spring constants of the first and second insulator rubbers 7, 8 may be selected depending on their configurations and other factors.

The bearing 5 allows the strut 20 to rotate around the axis of the piston 2a. Both ends 8a, 8b of the second insulator rubber 8 abut resiliently against the first bracket 6 so as to seal the bearing 5 therebetween. A bumper rubber or pad 10 fitted onto the piston rod 2a functions to stop the shock absorber 2 of the strut 20 when it bounds. A dust cover or seal 15 is attached at its upper end between the lower face of the upper spring seat 4 and the upper portion of the coil spring 1 and at its lower end to a strut tube 2b of the strut 2 by a snap ring 16.

In operation, the inputs from the coil spring 1 and the bumper rubber 10 in case of the shock absorber's bounding are transmitted through the upper spring seat 4, second insulator rubber 8 and bracket 6 to the vehicle body 9. Th inputs from the piston rod 2a of the shock absorber 2 is transmitted through the first insulator rubber 7 and/or the bracket 6 to the vehicle body 9. As the separate insulator rubbers 7 and 8 are used, even if the shock absorber 2 is in a stick condition so that the piston rod 2a and the strut tube 2b move integrally, the small oscillation of the strut 20 can be effectively damped.

Figure 2 shows a prior art model device, and Figure 3 shows a model d vice according to the present invention. The same references as those

in Figure 1 denote the corresponding or like members. 18 denotes a tire. In Figure 2, the spring constant K_{11} of the insulator rubber 17 is 60 kg/mm, and the spring constant K_s of the coil spring 1 is 2 kg/mm. In Figure 3, the spring constant K_{13} of the first insulator rubber 7 is 20 kg/mm, the spring constant K_{12} of the second insulator rubber 8 is 100 kg/mm, and the spring constant K_s of the coil spring 1 is 2 kg/mm. The displacement x of the tire 18 is assumed as a small oscillation of 2mm. The spring constants of the total spring systems in Figures 2 and 3 are given as follows, respectively:

(1) In case of the prior art, the piston rod of the shock absorber 2 and the strut tube of the strut are rigidly connected to each other so that the displacement x of the tire 18 is directly transmitted to the insulator rubber 17, thereby the spring constant K_{11} of the insulator rubber 17 being applied to the total spring system. Consequently, the total spring constant K is given as follows:

$$K=K_{11}=60 \text{ kg/mm}$$

(2) According to the present invention, the spring constant K of the total spring system is given as follows:

$$K=\frac{1}{1/K_{12}+1/K_s}+K_{13}=22 \text{ kg/mm}$$

As can be seen from the foregoing, according to the present invention, an insulator rubber is divided into two separate parts, one for a piston rod of a shock absorber and the other for a coil spring and a bumper rubber so that the spring constant of the total spring system can be decreased about 1/3 as compared with that of the prior art spring system when the shock absorber is in a stick condition. Thus, the driver's and passenger's feeling can be remarkably improved.

The present invention may be practiced in other ways without departing from the spirit or essential character thereof. For instance, the second insulator rubber may be further divided into two separate parts, one for a coil spring and the other for a bumper rubber.

Claims

1. A strut type suspension for a vehicle, comprising:
a strut having a strut tube;
shock absorber having a piston rod attached into the strut tube;
a lower spring seat fixed to the strut tube;
a upper spring seat provided above the lower spring seat;
a coil spring placed between the upper and lower spring seats;
a bumper rubber or pad fitted on the piston rod of the shock absorber; and
a mounting insulator having a first and second insulator rubbers, the former used for the piston rod of the shock absorber and the latter used for the coil spring and the bumper rubber, the first and second insulator rubbers being separately placed.

2. A strut type suspension for a vehicle, comprising:
a strut having a strut tube;
a shock absorber having a piston rod partially inserted into said strut tube;
a lower spring seat fixed to said strut tube;
an upper spring seat provided above said lower spring seat;
a coil spring placed between said upper and lower spring seat;
a bumper rubber or pad fitted on said piston rod of said shock absorber and disposed below said upper spring seat; and
a mounting insulator disposed associated with said piston rod and receiving a force from said piston rod and the latter being associated with said upper spring seat and said bumper rubber and receiving a force from said coil spring and said bumper rubber, said first and second insulator rubbers being separately placed.

3. A strut type suspension of claim 1 or 2, wherein said second insulator rubber has a large rigidity than that of said first insulator rubber.

4. A strut type suspension of claim 1 or 3, wherein said second insulator rubber is placed between said upper spring seat and a first bracket fixed to said vehicle body.

5. A strut type suspension of claim 4, wherein both ends of said second insulator rubber abut resiliently on said first bracket so as to seal a bearing disposed between said first bracket and said second insulator rubber.

6. A strut type suspension of claim 5, wherein a second bracket is placed between said second insulator rubber and said bearing.

7. A strut type suspension of claim 1 or 2, wherein said first insulator rubber is fixed at the top of said piston rod and said second insulator rubber has a larger rigidity than that of said first insulator rubber.

8. A strut type suspension of claim 7, wherein said first insulator upper has a pair of rubber and lower portions for pressing a washer fixed to said piston rod in the opposite directions by placing said pair of lower and upper portions of said first insulator rubber between said vehicle body and a first bracket fixed to said vehicle body.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.